words fill up the raster without being aligned. If e.g. every second or every third etc. spectral value is known in the low frequency range and the interspersed code words are corrupted during transmission, it may be possible to reconstitute these code words in the decoder using error concealment techniques, e.g. prediction or similar.

The methods and devices for decoding a bit stream operate in such a way as to reflect the cited coding.

In a general method for decoding a bit stream representing a coded audio signal where the coded bit stream has code words of different length from a code table and a raster with equi-distant raster points (10, 12, 14), where the code words include priority code words which represent certain spectral values which are psychoacoustically important compared with other spectral values and where priority code words are aligned with raster points, (a) the distance D1 between two adjacent raster points is determined. If the distance between two raster points is known, (b) the priority code words in the coded bit stream which are aligned with the raster points can be resorted so as to obtain an arrangement in which they are ordered linearly as regards frequency and the start of a pri-ority code word coincides with a raster point. The priority code words now appear in the general frequency-linear arrange-ment shown in Fig. 2, so that (c) the priority code words can now be decoded with a code table with which they are associ-ated so as to obtain decoded spectral values. After (d) trans-forming the decoded spectral values back into the time domain, a decoded audio signal is obtained, which can be processed in some known way, e.g. in order to feed it into a loudspeaker.

If the bit stream is coded with just one code table, the dis-tance between the raster points can be established quite sim-ply by finding out from the side information of the bit stream

which table was used for coding. Depending on the coding, the
distance might then be the length of the longest code word of
this table, which could be set permanently in the coder. If
the distance is the length of the longest code word actually
occurring in a part of the bit stream to which a code table is
assigned, this is communicated to the decoder in the side in-
formation which is assigned to the bit stream, and so on.

The decoder performs a resorting of the priority code words
and also of the non-priority code words, e.g. by applying a
pointer to the coded bit stream. If the raster distance is
known to the decoder and the priority code words are arranged
linearly with frequency, the decoder can jump to a raster
point and read the code word which starts there. Once a code
word has been read the pointer jumps to the next raster point
and repeats the process just described. After all the priority
code words have been read, the bit stream still contains the
non-priority code words. If a linear arrangement of the prior-
ity code words and the non-priority code words in the bit
stream was chosen, the non-priority code words are already ar-
ranged linearly with frequency and can be decoded and trans-
formed back without further sorting.

If coding according to the third or fourth aspect of the pre-
sent invention has been chosen, either scramble information
can be transmitted as side information or the scrambled dis-
tribution is fixed a priori and is thus known to the decoder
from the start. The same considerations apply to the fourth
aspect. It is always possible to stipulate a fixed distribu-
tion or to choose a variable distribution which is communi-
cated to the decoder as side information.

An advantageous way of determining and manipulating the prior-
ity code words will now be discussed. After establishing a
raster for a coded bit stream, either by specifying the raster

distance when using just one code table or the raster dis-
tances when using a number of code tables, the priority code
words must be so positioned in the raster that each priority
code word coincides with a raster point.

According to a preferred embodiment of the present invention
this positioning is achieved by inserting the code words se-
quentially into the essentially empty raster from a kind of
sort table. A start is made with the first code word in the
table. The priority code words can thus be influenced by the
ordering of the code words in the table, priority code words
always being those code words in the table with a place in the
raster, i.e. for which raster points are available. For code
words in the table for which there are no further raster
points, there is no choice but to insert them in the remaining
free places in the bit stream. These code words are thus not
priority code words in the sense of the present invention.

The number of priority code words is not determined in ad-
vance. Priority code words are written until the memory avail-
able for the coded bit stream is full, i.e. until no further
priority code word can be written. The size of the memory is
equal to the total number of bits previously used for the
spectral data, i.e. no further bits are required by the
rastering. The memory is thus limited by the number of code
words to prevent the coding efficiency falling off as a result
of raster ordering. All the code words could, of course, be
placed on raster points to make them error tolerant. However,
this would lead to a marked decrease in the coding efficiency
since the free bits remaining between the raster points are
not used.

The first aspect of the present invention relates to determin-
ing the priority code words, i.e. the code words which repre-
sent the spectral values which are psychoacoustically impor-